

EUV Lithography and 3D IC (Invited), Banqiu Wu, Ajay Kumar, Applied Materials, Inc.

Lithography has been the most critical technology in integrated circuit (IC) manufacturing since invention of the IC in 1958. The number and speed of transistors in ICs have been increasing dramatically due to the progress in resolution in lithography. Lithographic resolution increased with the decrease in exposure wavelength, which finally pushed the semiconductor industry to pursue the extreme ultraviolet lithography (EUVL). Presently, most “showstoppers” are gone, but there are still several open critical challenges such as source power, resist line width roughness, and defect-free mask. EUVL is expected to be implemented for ≤ 22 nm technological nodes. However, interconnect delay of IC system became a very critical determining factor of system performance such as speed and power consumptions since the turn of the century. This fact drives development in three dimensional (3D) IC technologies using through silicon via (TSV) stacking approach for IC system performance improvement. Now, 3D IC technology offers an excellent route to further scale IC performance and thus becomes the key to enable “More Moore” and “More than Moore” technologies, which make one chip package have higher transistor density and more functional diversification than those enhanced only by shrinking the device feature size. Target of 3D IC is the optimization of the system rather than individual transistor or a chip. The main advantages of 3D IC are the smaller form factor, low energy consumption, high speed, and functional diversification. This paper gives a comprehensive review of EUVL and 3D IC technologies, and discusses the future of these two most critical technologies in semiconductor industry.